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Prototype Learning Activities for Grade 9 Science

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ABSTRACT

This research ascertained the effectiveness of prototype learning activities in teaching Grade 9 Science at Consolacion National High School- Day Class, Poblacion Occidental, Consolacion, Cebu. It was carried out to 200 Grade 9 students using the quantitative- inferential method. The study utilized a 50-item multiple test type which covered the competencies on characterizing the properties of metals in terms of their structure, explaining the formation of ionic and covalent bonding, and using the mole concept to express the mass of substances. This set of questions was given to the teacher and the student respondents to find out if there was a notable difference in the perceptions of the two respondent groups on the effectiveness of the prototype learning activities in terms of comprehensibility, ease of use, and relevance. Results showed that there was no significant difference in the perceptions of the two respondent groups of the aforementioned variables of effectiveness. There was no significant correlation between the students' perception on effectiveness and performance. The prototype learning activities were utilized during the intervention phase of this study as basis for an enhanced activities to be developed as the output of the study. It is composed of group simulations and questions to enhance learning and improve students' performance. Hence, it is recommended to all Grade 9 science teachers to arouse students' interest and increase their participation in the science activities.

KEYWORDS: *prototype, learning activities, teaching science, quantitative-inferential, Cebu, Philippines*

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INTRODUCTION

Science is one of the hardest academic subjects we must admit. That is why science education in the Philippines is one of the topmost priorities of the Department of Education (DepEd).The low performance in science of most of the public schools in the Philippines is evident in the results of international, national, regional and even division tests. Like for example the performance of Filipino students in the 2003 Trends in International Mathematics and Science Study (TIMSS) in which the Filipino second year high school students ranked 43rd in science out of 46 participants, Philippines was stuck at the bottom while striving and struggling at a passing level. Moreover, students' performance in the National Achievement Test (NAT) was even more discouraging. (Martin O. Michael Ina V.S. Mullis Eugenio J. Gonzales Steven J. Chrostwski, 2004).

The greatest challenge lies in the hands of the teachers how to overcome this weakness in the field of science. As science teachers, we teach our studentsthe important skills that they can use in other areas of their lives through concrete experience. The Deweyan Theory of Experience states that "teachers cannot give ideas directly to students as if they were bricks". That's why in our science classes, we usually design activitiesthat allow students to interact and work ingroups to learn science concepts by actual or hands on participation.

According to Kolb, (1984) "Learning is the process whereby knowledge is created through the transformation of experience". The Experiential Theory by Kolb is composed of four stages(i) concrete experience , the stage where the learner actively experiences an activity such as a lab session or field work; (ii) reflective observation , is when the learner consciously reflects back on that experience; (iii) abstract conceptualization, is where the learner attempts to conceptualize or visualize a theory or model of what is observed; and (iv) active experimentation , is where the learner is trying to plan how to test a model or theory or plan for a forthcoming experience.

Lindsay and Norman (1997) stated that perception is the process by which organisms interpret and organize sensation to produce a meaningful experience of the world. Moreover, teaching strategy is another factor which can helpfully turn experience into learning. And so, the prevailing situation plainly and simply tells us that teachers should give learning activities which can make learning a very meaningful one and allows student to discover the concept by their own. The said activities must be student-centered in order to suit to the 21st century learners. These are activities that would allow students to showcase their own and unique skills and strengths. That is why this study is conducted to determine the effectiveness of the prototype learning activities based from the curriculum guide in the teaching of chemistry of Grade 9 Science.

BACKGROUND OF THE STUDY

This research assumption is anchored on Learning by Doing Theory of John Dewey which explains how students learn through hands-on approach and realistic experience. He

theorized that learning becomes more relevant and more practical if learners actively participate in a group activity. In his pedagogic creed, Dewey added that schools must represent present life as real and vital to the child as that which he carries on in the home, in the neighborhood, or on the playground.

To Kolb, learning by doing technique provides concrete experience and facilitate greater continuity of learning. He also concluded that if learners physically interact with the phenomenon so it will provide higher opportunity of learning. He categorized learning into four cycles: (i) concrete experiences as basis for observation, (ii) individual's reflection, (iii) formation of the abstract concepts, and (iv) the testing of the implications of these concepts into new situations.

Moreover, R.A. 10533 also known as the "The Enhance Basic Education Act of 2013 is the legal basis of this study. Section 5 of this law states that make education learner-oriented and responsive to the needs, cognitive and cultural capacity, the circumstances and diversity of learners, schools and communities through the appropriate languages of teaching and learning, including mother tongue as a learning resource. Moreover, the law is concerned on a collaborative, integrative, and an inquiry-based curriculum. It encourages teachers to promote inductive or the discovery approach of teaching in order to achieve the higher performance required by the Department of Education.

OBJECTIVE OF THE STUDY

This research determined the effectiveness of the prototype learning activities in the teaching of chemistry in Grade 9 science at Consolacion National High School. The research study is quantitative-inferential that provides relationship of the two variables – effectiveness of the prototype learning activities and perception. Both variables were given equal chances to be seen on the child respondents and tested for significance with existence from the other. It is hypothesized that the effectiveness of the activities has no correlation associated with perception and higher scores in the three competencies for the second quarter. The result of this study would aid in the design and implementation of teaching strategies and instructional materials to target developing performance of teachers and students in science.

RESULTS AND DISCUSSION

Characterizing the Properties of Metals

On characterizing the properties of metals in terms of their structure, there were ten (10) items under this competency. In this section students' knowledge and learning on the important characteristics of metals were measured.

Table1. Characterizing the Properties of Metals in Terms of Their Structure

Item No.	Correct Responses	Wrong Responses	
1	198	2	
2	188	12	
3	183	17	
5	192	8	
7	161	39	
9	175	25	
11	188	12	
14	195	5	
15	199	1	
18	200	0	
TOTAL	1879	121	
AVERAGE	187.9	12.1	
No. of Students getting 10 (OUTSTANDING)			168
No. of Students getting 8-9 (VERY SATISFACTORY)			29
No. of Students getting 7-6 (SATISFACTORY)			3
No. of Students getting 5 (FAIRLY SATISFACTORY)			0
No. of Students getting 4 and below (Did Not Meet Expectations)			0
TOTAL			200

These characteristics include the ability of metals to donate or give electrons. Students are expected to explain why metals are mostly highly reactive. This also includes the concept that metals differ not only in their properties but also with their structure.The table clearly illustrates the performance of the 200 respondents in the second periodical test. Ten (10) items were under the first competency which is *characterizing the properties of metals in terms of their structures.* The respondents got a total score of 1, 879 points with an average score of 187.9 for the correct responses and 12.1 for the wrong responses. Below the table is the summary part of the result which denotes that one hundred sixty-eight (168) out of two hundred (200) students got ten points on this competency. Twenty-nine (29) students got the scores of 8-9 while only three (3) got 7-6 and no one got the score of 5 and below. It means that the performance of the students were on the Outstanding level since more than one-half of the population got the score of 10.NAs what Kolb had mentioned in his Experiential Learning Theory that concrete experience enables the students to actively, reflectively, and consciously conceptualized a difficult concept or theory. To Hickman, learning tasks need active participation of the students and content must connect to students' life and experiences. Because in this technique, students may find their experiences enjoyable and memorable. Evidently, this was reflected in the test scores of the students for this competency.

Explaining the Formation of Ionic and Covalent Bonding

On explaining the formation of ionic and covalent bonding, students' understandings on the two most common types of bond were checked. Students were able to discuss the process of electron transfer. The highlight of this competency was that students will be able to explain when did the giving, taking or receiving, and sharing of electrons happen.

Table2. Explaining the Formation of Ionic and Covalent Bonding

Item No.	Correct Responses	Wrong Responses	
16	189	11	
17	197	3	
19	131	69	
20	200	0	
21	194	6	
22	196	4	
23	190	10	
25	189	11	
26	193	7	
27	200	0	
TOTAL	1879	121	
AVERAGE	187.9	12.1	
No. of Students getting 10 (OUTSTANDING)			59
No. of Students getting 8-9 (VERY SATISFACTORY)			129
No. of Students getting 7-6 (SATISFACTORY)			10
No. of Students getting 5 (FAIRLY SATISFACTORY)			2
No. of Students getting 4 and below (Did Not Meet Expectations)			0
TOTAL			200

The table shows that another ten (10) items were all about the formation of ionic and covalent bonding. The respondents got a total score of 1879 points with an average score of 187.9 for the correct responses and 21.1 for the wrong responses. The data mean that the overall performance of the students on this competency reaches the Very Satisfactory level. As shown in this table that most of the items, students' scores are in very satisfactory level which is 8-9. This also means that the students who got 8-9 scores were on the 65 % and of the total population which is 200. It signifies that above 50% of the students have mastered this competency on e*xplaining the formation of ionic and covalent bonding.*

Using the Mole Concept to Express Mass of Substance

On using the mole concept to express mass of substances competency, students' mathematical skills were tested. This enabled the students to solve word problems regarding mole of a substance. They were also expected to follow procedure in performing calculations that would show the relationship between mass, mole, and number of atoms.

Table3. Using the Mole Concept to Express Mass of Substances

Item No.	Correct Responses	Wrong Responses	
28	200	0	
29	195	5	
30	185	15	
31	200	0	
32	200	0	
35	189	11	
TOTAL	1169	31	
AVERAGE	194.83	5.16	
No. of Students getting 6 (OUTSTANDING)			38
No. of Students getting 5 (VERY SATISFACTORY)			151
No. of Students getting 4 (SATISFACTORY)			8
No. of Students getting 3 (FAIRLY SATISFACTORY)			3
No. of Students getting 2 and below (Did Not Meet Expectations)			0
TOTAL			200

The Table clearly illustrates the performance of the 200 respondents in the third competency for the second quarter. There were six (6) items which fall on *using mole concept to express the mass of substances*. The respondents got a total score of 1, 169 points respectively with an average score of 194.8 for the correct responses. For the wrong responses the sum is 31 with an average of 5.2. These data implied that the performance of the students were on the Very Satisfactory level.As shown in the table, one hundred fifty-one (151) students got the score range of 8-9. Thirty-eight students got the score of six (6) points,eight (8) students scored 7-6 while only three (3) got 5 points. The data imply that most of the students have grasp and understood the topic on using mole concept to express mass of substances. One hundred fifty-one (151) out of two hundred (200) respondents achieved this performance equivalent to 76% of the total population.. Based on percentile rank, the group placed on an average score.This supports the idea of Peggy Hickman that if teachers presented real life problems to the students and

have guided them to solve problems by providing them with a hands-on activity, they were able to learn a solution easily and were able to reflect their experiences. Moreover, Constructivist Learning Theory states that providing learners with opportunities to engage in hands-on activities will allow them to explore, manipulate, and discover through their own.

STUDENTS' PERCEPTIONS ON THE EFFECTIVENESS OF THE PROTOTYPE LEARNING ACTIVITIES

Table5. Respondents Perception on the Effectiveness of the Prototype Activities in terms of Comprehensibility

Item No.		Students		Teachers	
		Mean	Description	Mean	Description
1	The activity gives teachers and students prescriptive and sequential instruction.	3.51	Strongly Agree	4.00	Strongly Agree
5	Students have enough time to think about what they are doing.	3.23	Agree	3.50	Strongly Agree
16	The activity allow students to conduct their own investigations..	3.20	Agree	4.00	Strongly Agree
22	The activity is simple.	2.84	Agree	3.50	Strongly Agree
24	The activity is lively and fun.	3.36	Strongly Agree	4.00	Strongly Agree
25	The facts or concept of the activity are important to learn.	3.50	Strongly Agree	4.00	Strongly Agree
27	The students can understand and can follow the procedure of the activity.	3.27	Strongly Agree	4.00	Strongly Agree
29	The procedure of the activity is not difficult to follow.	3.17	Agree	4.00	Strongly Agree
30	The activity helps students understand difficult science concepts.	3.15	Agree	4.00	Strongly Agree
	Average Weighted Mean	3.25	Strongly Agree	3.89	Strongly Agree
	Standard Deviation	**0.2**		**0.22**	

The table shows the results of the respondents' perception as regards their understanding of the content, instructions, and procedure of doing the performance tasks. Student respondents agreed on item number 1 about prescriptive and sequential instruction while teacher respondents agreed strongly on the same item (perceived mean levels ranging from 3.51 -4.0). Similar strong affirmation from the two respondent groups were given to items 24,25, and 27 with the means of 3.36, 3.50 3.27, and 4.0, respectively. Both teachers and students affirmed that the activity was interesting, significant and clear. The respondents also agreed that they had enough time to process the activity stated in Item 5 and did their own critical analysis stated in Item 16. Such response gained 3.23, 3.50, 3.20, and 4.00 mean respectively. While on item 29 with a 3.17 (Agree) and 4.00 (Strongly Agree) mean, the respondents found out that doing the activity was easy to follow. Even in item 22, the respondents could still relate the similar response that the activity was simple which gained 2.84 (Agree) and 3.50 (Strongly Agree) mean levels. Lastly, the respondents asserted positively in item number 30 with a mean of 3.15 and 4.00. They were able to understand the difficult science concepts. Results showed that the activity was effective for instruction. Lumpe and Oliver (1991) stated that hands-on activities in science which allow the students to actively participate is far different from conventional lectures and demonstrations. In general, table showed that the mean scores for both respondents which are 3.25 and 3.89 respectively, implied that they agreed to the positive impact of the activities as far as students interest and attitude is concerned.

CONCLUSION

Based on the results of the investigation, the prototype learning activities for Grade 9 Science is an effectual strategy in facilitating the selected topics in Science 9. It showed that the perceptions of the two respondent groups have no significant difference. Moreover, students perceived that the activity is relevant to their future and everyday life as evidently shown in their responses with a highly significant result .This further implied that collaborative activity would be more helpful in making the students become more responsive to the teacher.

RECOMMENDATIONS

Based on the findings of this research, the following recommendations are formulated. Teachers have to provide activities which allow students to work collaboratively. Thinking or designing activities that would arouse students' interest in their topic and that would also cater their strengths and weaknesses are relevant. The Prototype Learning Activities may be tried by other science teachers to help them increase the participation and performance of their students. Updating themselves with the current trends on aspects of diversity in relation to modern demands and social changes that address the learners' uniqueness and differences is very much helpful.

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